

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1 Claim 1 (original): A component mounting apparatus
2 comprising:
3 a nozzle for holding a component at its lower end,
4 said component being supplied from a component supply unit;
5 a nozzle elevating means for moving said nozzle
6 up/down;
7 a nozzle moving means for moving said nozzle
8 horizontally;
9 obstacles higher than a height with which said
10 component is picked up from said component supply unit or
11 a height with which said component is to be mounted on a
12 board conveyed by conveyance rails; and a
13 control means for controlling said nozzle elevating
14 means and said nozzle moving means so that said component
15 moved by said nozzle moving means is mounted on said board;
16 wherein said control means stores positions and
17 heights of a plurality of said obstacles disposed between
18 said component supply unit and said board; and when said
19 nozzle having picked up said component in a position to
20 pick up said component from said component supply unit is
21 to move to a position to mount said component on said
22 board, said control means locates said nozzle at a height

23 high enough not to interfere with a first one of said
24 obstacles and then moves said nozzle to a height high
25 enough not to interfere with a next one of said obstacles
26 in sync with the time when said nozzle has finished passing
27 over said first obstacle.

1 Claim 2 (original): A component mounting apparatus
2 according to Claim 1, wherein: said obstacles include at
3 least one of a component camera for photographing said
4 component from below said nozzle, one of said conveyance
5 rails for conveying said board, a nozzle station for
6 storing spare nozzles, and a reference mark provided
7 between said component supply unit and said board and for
8 performing position correction; and after said component
9 has been photographed by said component camera, said nozzle
10 is moved down in sync with the time when said nozzle has
11 finished passing over said component camera, said nozzle is
12 moved down in sync with the time when said nozzle has
13 finished passing over said conveyance rail, said nozzle is
14 moved down in sync with the time when said nozzle has
15 finished passing over said nozzle station, or said nozzle
16 is moved down in sync with the time when said nozzle has
17 finished passing over said reference mark.

1 Claim 3 (original): A component mounting apparatus
2 comprising:

3 a nozzle for holding a component at its lower end,
4 said component being supplied from a component supply unit;
5 a nozzle elevating means for moving said nozzle
6 up/down;
7 a nozzle moving means for moving said nozzle
8 horizontally;
9 obstacles higher than a height with which said
10 component is picked up from said component supply unit or
11 a height with which said component is to be mounted on a
12 board conveyed by conveyance rails; and
13 a control means for controlling said nozzle elevating
14 means and said nozzle moving means so that said component
15 moved by said nozzle moving means is mounted on said board;
16 wherein said control means stores positions and
17 heights of a plurality of said obstacles disposed between
18 said component supply unit and said board; and when said
19 nozzle having picked up said component in a position to
20 pick up said component from said component supply unit is
21 to move to a position to mount said component on said
22 board, said control means determines a horizontal path to
23 allow said nozzle to move to a component mounting position
24 on said board while keeping a predetermined height, and
25 moves said nozzle in said horizontal path.

Claim 4 (cancelled)

1 Claim 5 (previously presented): A component mounting
2 apparatus including:

3 a nozzle for holding a component at its lower end so
4 as to mount said component on a board, said component being
5 supplied from a component supply unit;

6 a nozzle elevating means for moving said nozzle
7 up/down; a nozzle moving means for moving said nozzle
8 horizontally; and

9 a control means for controlling said nozzle elevating
10 means and said nozzle moving means so that said component
11 moved by said nozzle moving means is mounted on said board,
12 wherein: said control means controls said nozzle elevating
13 means so that said nozzle approaches a component mounting
14 region movement height close to said board when said nozzle
15 has arrived in a component mounting region above said
16 board; and the control means controls said nozzle moving
17 means so that said nozzle holding said component at said
18 component mounting region movement height is moved to a
19 component mounting position on said board so as to mount
20 said component from said component mounting region movement
21 height to said component mounting position; and board
22 marks provided on end portion sides of said board are
23 recognized, and said component mounting region is
24 calculated based on said recognized board marks.

1 Claim 6 (previously presented): A component mounting
2 apparatus according to Claim 4, further comprising: a
3 conveyance rail movable in accordance with a width of said
4 board to be conveyed; and a position detection means for
5 detecting a position of said conveyance rail; wherein said
6 component mounting region is not calculated based on said
7 recognized board marks but said component mounting region
8 is calculated from information of said position of said
9 conveyance rail detected by said position detection means.

1 Claim 7 (currently amended): A component mounting
2 apparatus according to ~~any one of Claims 5 through 6~~Claim
3 5, wherein said component mounting region movement height
4 is a height defined in consideration of a height of each
5 component mounted on said board, a height of said component
6 held by said nozzle, and a gap necessary for said nozzle to
7 move.

1 Claim 8 (currently amended): A component mounting
2 apparatus according to ~~any one of Claims 5 through 7~~Claim
3 5, wherein when said component is to be mounted from said
4 component mounting region movement height to said component
5 mounting position on said board, said control means drives
6 said nozzle elevating means and said nozzle moving means
7 simultaneously so as to move said nozzle in an arc moving
8 trajectory.

1 Claim 9 (original): A component mounting method
2 comprising the steps of:
3 using a nozzle to hold a component at its lower end,
4 said component being supplied from a component supply unit;
5 moving said nozzle up/down and horizontally while
6 avoiding obstacles higher than a height with which said
7 component is picked up from said component supply unit or
8 a height with which said component is to be mounted on a
9 board conveyed by conveyance rails; and
10 mounting said component on said board;
11 wherein positions and heights of a plurality of said
12 obstacles disposed between said component supply unit and
13 said board are stored; and
14 when said nozzle is to move from a position to pick up
15 said component from said component supply unit to a
16 position to mount said picked-up component on said board,
17 a highest one is found from said plurality of obstacles,
18 said nozzle is moved up to a height high enough not to
19 interfere with said highest obstacle, said nozzle is moved
20 horizontally, a current height of said nozzle is compared
21 with a height of an obstacle said nozzle will pass over as
22 soon as said nozzle has finished passing over said highest
23 obstacle, and said nozzle is moved down to a height high
24 enough not to interfere with said obstacle said nozzle will

25 pass over when said nozzle is higher than the height of
26 said obstacle.

1 Claim 10 (previously presented): A component mounting
2 method comprising the steps of:
3 using a nozzle to hold a component at its lower end,
4 said component being supplied from a component supply unit;
5 moving said nozzle up/down and horizontally; and
6 mounting said component on a board;
7 wherein a component mounting region above said board
8 is calculated by recognizing board marks provided on end
9 portion sides of said board; said nozzle is made to
10 approach said component mounting region movement height
11 close to said board when said nozzle has arrived in said
12 component mounting region above said board; said nozzle
13 holding said component at said component mounting region
14 movement height is moved to a component mounting position
15 on said board; and said component is mounted from said
16 component mounting region movement height to said component
17 mounting position.

1 Claim 11 (original): A component mounting method
2 according to Claim 10, wherein a horizontal movement
3 operation and an elevating operation are performed
4 simultaneously so as to move said nozzle in an arc moving

5 trajectory when said component is to be mounted on said
6 board.